June 29, 1965 K. NICOLAY 3,191,561

SEWING MACHINE UPPER FEED CONTROL

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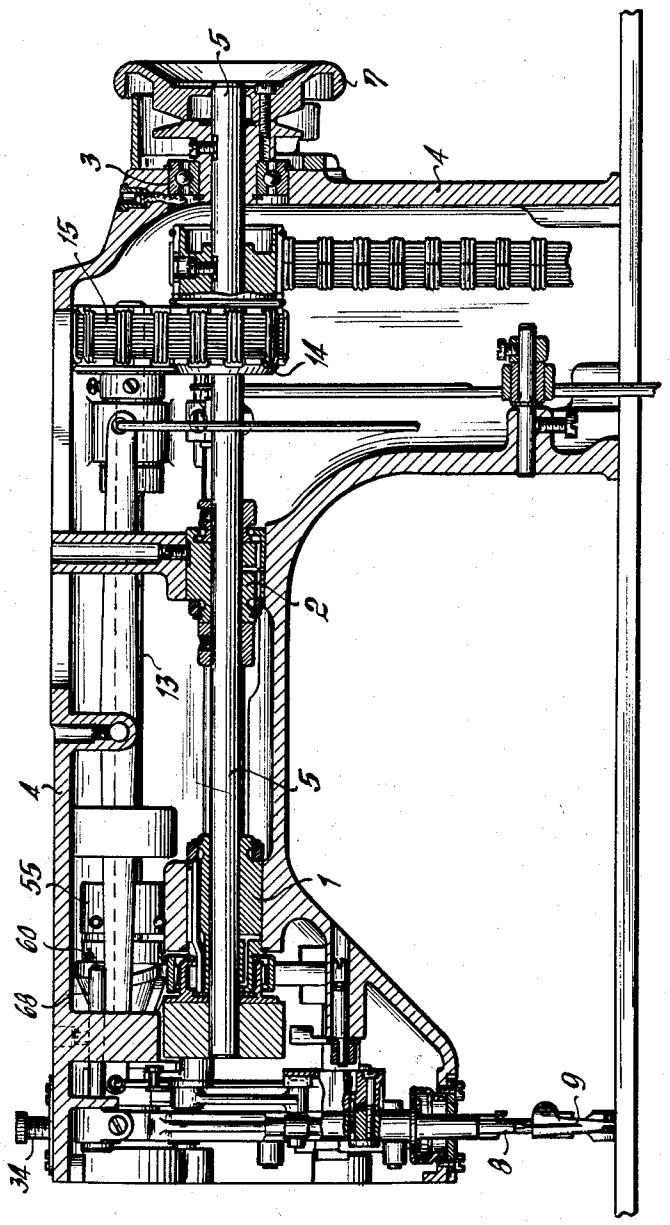


FIG. 1

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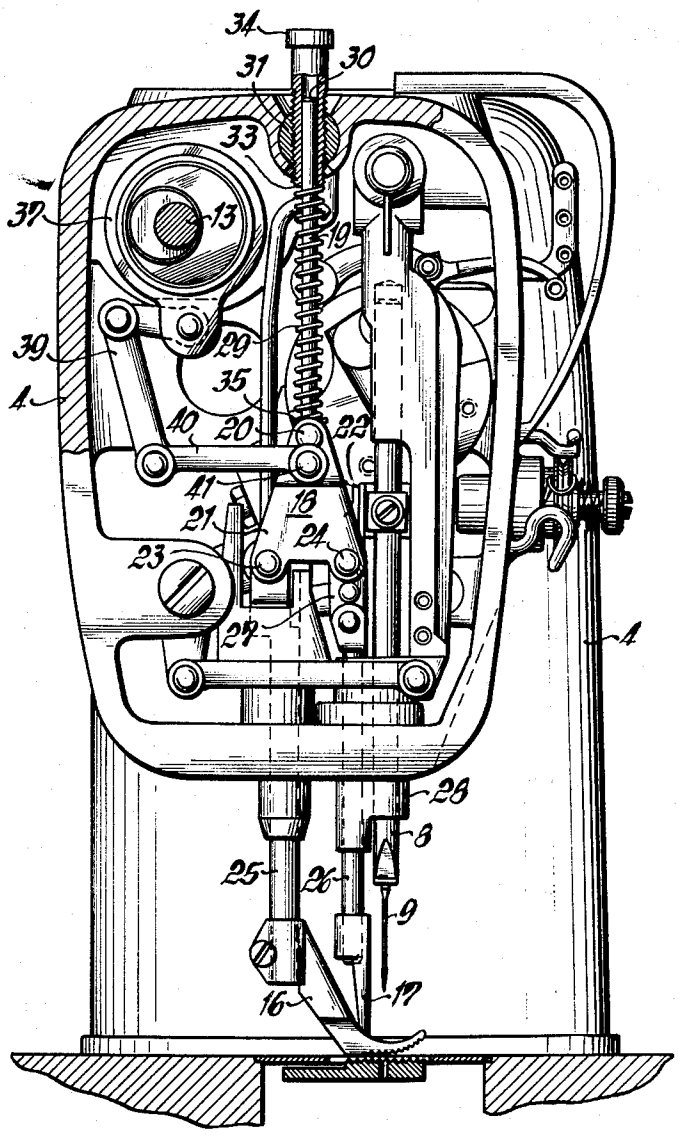
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FIG. 2



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FIG. 4

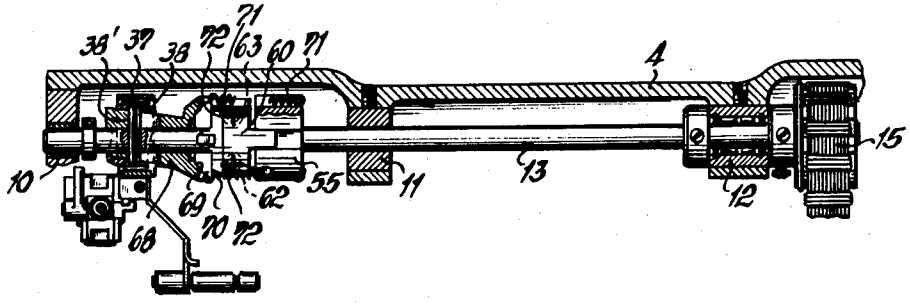


FIG. 3

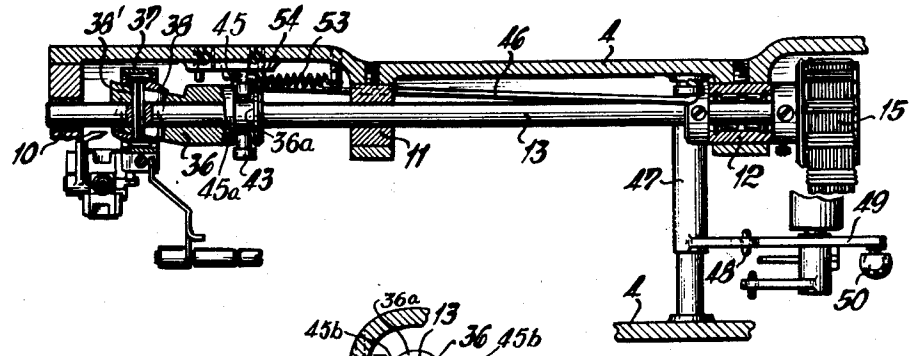
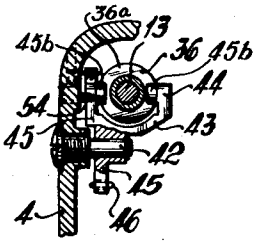


FIG. 5



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SEWING MACHINE UPPER FEED CONTROL

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FIG. 6

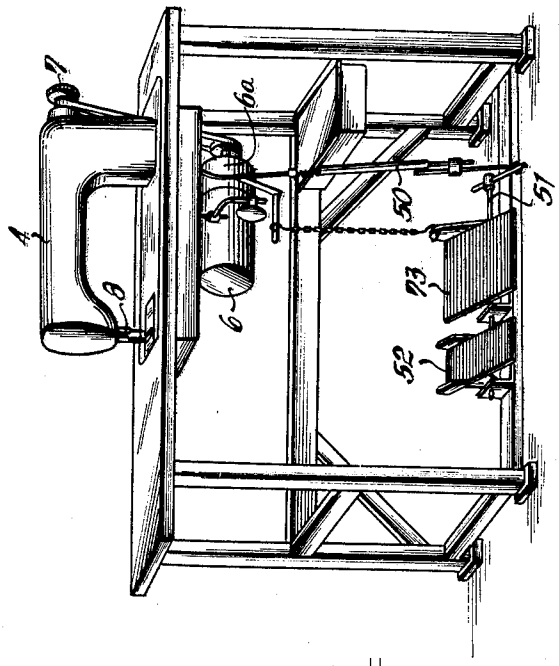
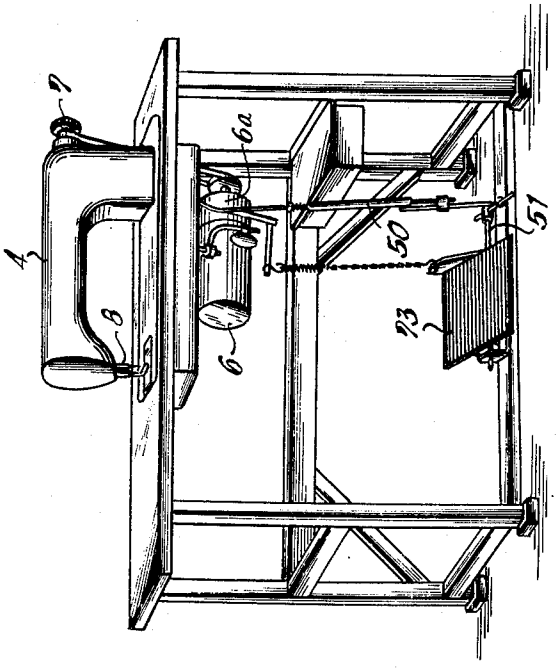


FIG. 7



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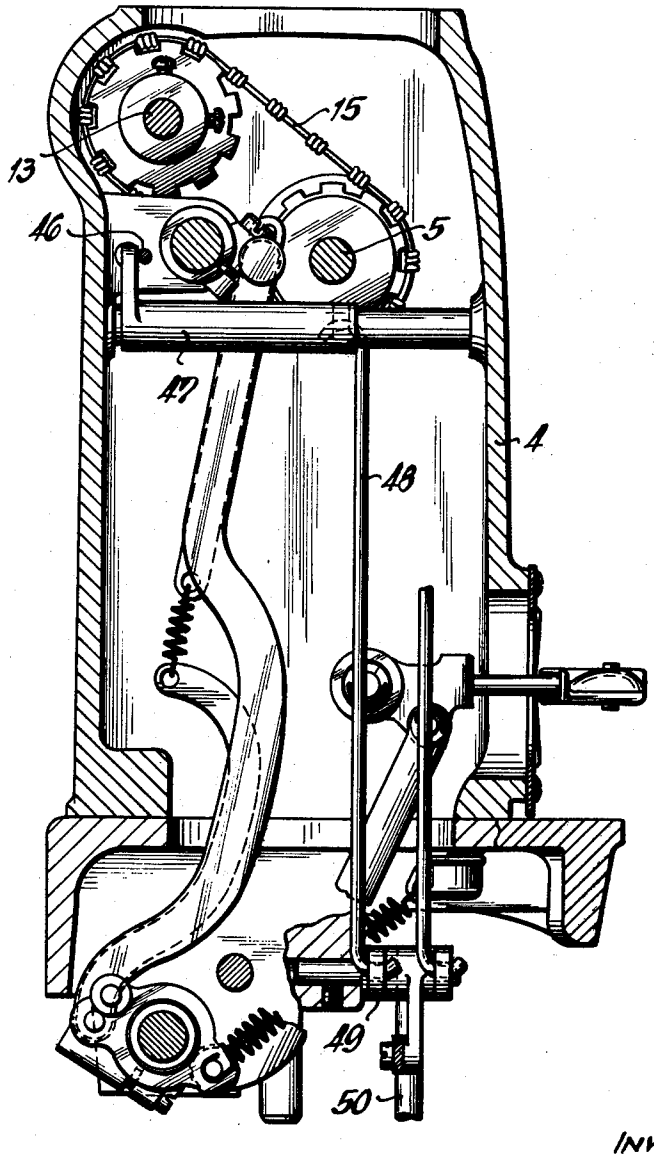
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SEWING MACHINE UPPER FEED CONTROL

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FIG. 8



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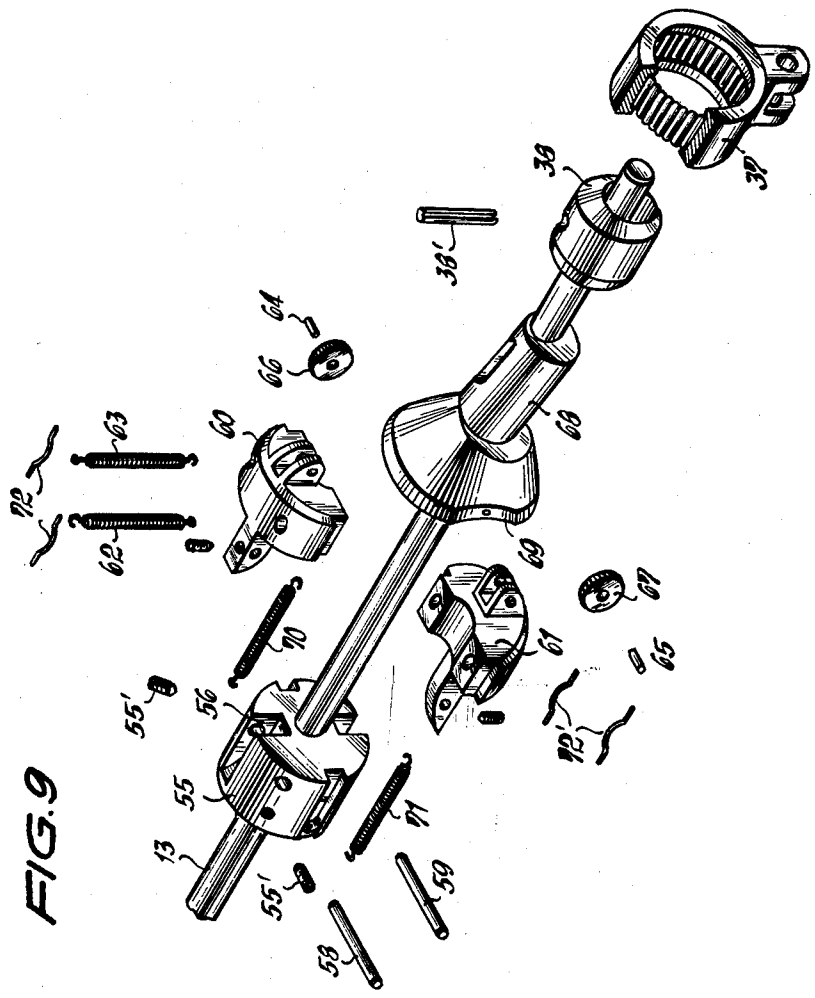


FIG. 9

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United States Patent Office 3,191,561 Patented June 29, 1965

3,191,561

SEWING MACHINE UPPER FEED CONTROL

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Filed Mar. 18, 1963, Ser. No. 265,761
Claims priority, application Germany, Mar. 26, 1962, D 38,480
7 Claims. (Cl. 112—212)

This invention relates to a sewing machine of the kind in which the work feeding devices, include an upper feeder foot which is raised from the workpiece alternately with a presser foot, and the invention relates in particular to a control means for varying the lift stroke of these alternately operating feet, during the running of the machine.

It is known that the lift stroke to be given to the upper feeder member and to the pressed foot depends at any given time on the thickest place of the piece of material to be sewn for example seams or the like which are to be stitched across. The higher the foot stroke must be, in order to sew over these thick places, the more the material feeder device when driven at high speed, tends to flutter and this reduces the output of the sewing machine in that the maximum sewing speed must be kept sufficiently low to avoid this risk. Because of the thicker places in the sewing path, this limitation means therefore has meant that the necessary lifting stroke for overcoming the thicker places determines the sewing machine speed for the whole sewing operation.

In order to combat this output reducing fault, it is proposed according to the present invention to make the foot stroke of the alternately working feet variable during the running of the sewing machine by an adjustment means which is controllable for this purpose either directly or indirectly. Thereby it is attained that even thick material can be fed with comparatively small foot stroke at high sewing speed, and thicker places to be crossed by the stitching are climbed over by the alternating feeder and presser feet with a larger lifting stroke.

For varying the foot stroke of the feeder and presser feet various controls are proposed according to the invention which render it possible to control suitably the driving mechanism of the feed during the running of the sewing machine, by directly or indirectly influenced adjusting means.

Thus, for the purpose of the direct influencing of the lifting stroke of these feet, control means are provided which act directly on the means for the adjusting of the lifting stroke and are made effective by operation of a foot lever or the like means actuated at the instance of the operator.

For the indirect influencing of the lift stroke of the alternating feet, a control device influenced automatically by centrifugal force may be employed, reacting suitably on variation of the speed of rotation of the machine at the time.

Furthermore, according to the invention there may be provided an indirectly effective control means for the adjusting of the lifting stroke which is in communication with the regulating device for controlling the drive to the sewing machine.

The invention will now be described with reference to the accompanying drawings, wherein:

FIG. 1 shows a vertical section through the upper part of a sewing machine with a feeder foot lifting from the workpiece alternately with the presser foot and a control device working indirectly according to the invention;

FIG. 2 shows a part-sectional front end view of the upper part of the same sewing machine;

FIG. 3 is a section of a portion of the upper part of the machine showing the drive of the work-feeding device and control elements for direct control;

FIG. 4 shows a similar view but with the drive of the work-feeding device and control elements for indirect control;

FIG. 5 is a sectional transverse view of parts for the control of the drive of the work-feeding device;

FIG. 6 shows a sewing table arrangement for direct control of the feeding device;

FIG. 7 shows a sewing table arrangement for indirect control of the feeding device;

FIG. 8 is a section through the part of the sewing machines, with a view of the control member, and;

FIG. 9 is an exploded view of a centrifugal governor.

As shown the improved sewing machine carries in bearings **1**, **2** and **3** (FIG. 1) of the upper part **4** a rotating arm shaft **5**. The drive of the sewing machine is effected in the usual manner from a motor **6** (FIG. 6) via a clutch device **6a** and a driving pulley **7** on the said arm shaft **5**. Besides the known driving mechanism for the movements of the needle bar **8**, which carries a sewing needle **9** and which moves with the advance of the workpiece, the arm shaft **5** drives a parallel shaft **13** held in bearings **10**, **11** and **12** (FIG. 3) of the upper part **4**, the drive being via a driving gear **14** and a timing belt **15** so that the shaft **13** rotates at the same speed as the arm shaft **5**.

The shaft **13** serves for actuating means for the driving of an upper work-feeding device, the foot **16** (FIG. 2) of which is raised and lowered alternately with a presser foot **17** of the sewing machine, relatively to the work material being fed below the needle. For producing the lifting and pressing movement of the feeding and presser feet **16**, **17** there is used what is the equivalent of two bent levers, namely a triangular lever **18** and a compression spring guide rod **19**. Hereby the spring guide rod **19** serves as the one arm of each of the two bent levers and is linked in a joint **20** of the triangular lever **18**. The virtual arms **21**, **22** of the triangular lever **18** lead from the joint **20** to links **23** and **24** and thereby to the pressure foot **16** and to the feeder foot **17**. The link **23** connects the triangular lever **18** to the presser foot bar **25** within the upper part **4** of the machine.

For the connection of the triangular lever **18** to the feeder foot bar **26** a link **27** is used so that such bar **26**, mounted in a needle pivot frame **28** can participate with the feeder foot **17** in the advancing movement of the lower feeder beneath the needle plate. For the resilient pressure of the feeder and presser feet **17** and **16** the triangular lever arrangement is sprung by means of a compression spring **29** carried on the spring guide rod **19**. With its upper end **30** the spring guide rod **19** is axially movable through a bearing **31** located in the upper part **4** of the machine and pivotally mounted to accommodate the movements of the triangular lever **18**. Thereby the compression spring **29** is supported on the lower edge **33** of an adjusting screw **34** mounted in the bearing **31** and, according to the screwing-in depth of screw **34**, acts on the triangular lever arrangement via the pressure ring **35**, which lies between the bottom end of the spring and the upper joint **20** of the lever **18** where it receives the spring guide rod **19**, that is, the compression spring **29** presses down both the feeder and presser feet **17** and **16**, into the respective working positions on the material being sewn.

As a driving means for the operation of the upper feeder arrangement there is used, for example, an oblique cam **36** (FIG. 3) which, for the purpose of adjustment of its magnitude of lift, is movable on the shaft **13**. Around the eccentric part of the oblique cam **36** there is placed an eccentric ring **38** which is so held by means of a pin **38'** that the oblique cam **36** can be moved in a functional manner in the bore of the eccentric ring **38** for the adjust-

ment of the stroke. For the operation of the triangular lever arrangement, an eccentric strap 37 is used. This provides the connection to a link transmission which is composed of a double-armed lever 39 (FIG. 2) mounted in the upper part 4 of the machine and an intermediate member 40 the end of which is articularly connected to the triangular lever 18 on the free end of the pivot bolt 41 which is fixedly carried by that lever.

For the control of the oblique cam 36 (FIG. 3), for the purpose of the adjustment of the necessary lifting stroke, the invention provides means which are effective either directly or indirectly.

For the direct control of the cam 36, there is provided a fork lever 43 (FIG. 5) which can swing around a bolt 42 mounted in the upper part 4 of the machine. With its arms 44 and 45 which engage around the hub 45*a* of the oblique cam 36, it carries slide blocks 45*b* which enter into an annular groove 36*a* of the oblique cam 36 to effect the sliding movement along the shaft 13.

A control transmission comprising parts 46, 47, 48, 49, 50 and 51 connects the arm 45 of the lever 43 to a foot pedal 52 (FIG. 6) which is independent of a foot pedal 73 for the operation of the normal clutch of the driving motor of the machine. Upon operation of the pedal 52 the fork lever 43, normally held by the spring 53 against a fixed stop 54 (FIG. 3) in the upper part 4, can be pivoted against the pull of the spring 53, and thereby move the oblique cam 36 through the ring 38 for the adjustment of the lifting stroke of the alternating feeder foot 16 and presser foot 17, during the running of the sewing machine. According to the construction of the oblique cam 36, an adjustment from small to large lift stroke or vice versa can be effected.

For the indirect control of the lifting stroke, a centrifugal governor is proposed which is arranged on the shaft 13 and operates in dependence on the rotational speed transmitted to this shaft. The centrifugal governor includes a part 55 (FIG. 9) which is firmly screwed on the shaft 13 by screws 55'. The part 55 carries in opposite grooves 56, 57 centrifugal weight levers 60 and 61, guided pivotally on bolts 58, 59. These centrifugal weight levers are drawn together by traction springs 62, 63 acting between holding means 72 and 72', so that rollers 66 and 67 rotatably mounted on bolts 64 and 65 on the end of the levers 60, 61 lie on the shaft 13, when the governor is in the neutral position.

For its control by the centrifugal governor the oblique cam 68, movably located on the shaft 13, is provided interiorly with an ascending curved path 69 (FIG. 4). Traction springs 70, 71, fixed at one end on the part 55 and at the other end on the oblique cam 68, draw such curved path 69 towards the rollers 66 and 67 of the centrifugal weight levers 60 and 61 so that when the centrifugal force is effective the rollers 66 and 67 separate and roll on the curved path 69 as the cam is pulled axially by the springs 70, 71, in dependence on the rotational speed of the shaft 13, and thereby the lifting stroke of the alternating feet 16 and 17 is varied indirectly in dependence on the speed of operation of the sewing machine.

A likewise indirectly effective control of the lifting stroke for the feet 16 and 17 is attained if the oblique cam 36 (FIG. 3) is adjusted by means which operate in dependence on the speed regulating devices in the drive of the sewing machine. This can be attained in a simple manner if the oblique cam 36 (FIG. 3) as in the first-described direct control arrangement is linked by the fork lever 43, and the control members 46, 47, 48, 50 and 51 (FIGS. 3, 8 and 7) not now into connection with the foot pedal 52 (FIG. 6) but with the foot pedal 73 (FIG. 7) which serves for the operation of the clutch of the motor 6. Thereby, the lifting stroke of the feet 16 and 17 can be automatically controlled in dependence on the regulation of the drive of the sewing machine. Direct or indirect control, that is, control dependent on or independent of the speed of operation of the sewing machine can be attained in this manner with small expenditure.

What I claim is:

1. In a sewing machine, in combination with a presser foot having a lifting bar, an upper feeder foot having a lifting bar and means for lifting the feeder foot and the presser foot from a workpiece alternatively, a control device for varying the extent of lift of said presser foot and feeder foot comprising a lever having three pivot points in a substantially triangular arrangement, a first pivot connection between one of said pivot points of said lever and said presser foot lifting bar, a second pivot connection between a second point of said lever and said feeder foot lifting bar, spring means bearing upon and urging movement of said three point lever to depress the said lifting bars, a drive shaft, an oblique cam supported on said drive shaft for sliding movement thereon and connected thereto for rotation therewith, an eccentric fixed to said drive shaft and transfixed rotatably by said oblique cam, an eccentric strap on said eccentric, a rocker arm, a pivotal coupling between an end of said rocker arm and said eccentric strap, a third pivot connection between the third pivot point of said lever and an opposite end of said rocker arm, rotation of said shaft and its oblique cam causing said eccentric and rocker arm to tilt the said lever to and fro to raise the said lifting bars alternately, and means for imparting axial movement to the oblique cam to vary the throw of the eccentric and thereby vary the lift of said lifting bars.

2. The combination according to claim 1, wherein said oblique cam has an annular groove concentric with said drive shaft, a pivoted fork member engaging in the said groove, a pull rod having one end connected to said pivoted fork member, spring means urging said cam and fork member to one end position, an operator-influenced control member, and a linkage mechanism connecting said control member to the other end of said pull rod.

3. The combination according to claim 1, with a pivot block fixed on said drive shaft, weighted levers pivotally mounted on said block and lying along opposite sides of said drive shaft, spring means urging said levers towards said drive shaft, means forming an annular camming surface on said oblique cam and encircling said shaft and facing toward said block, rollers on said weighted levers engaging the said camming surface, and urging said annular camming surface into engagement with said rollers, said weighted levers being movable outwardly under centrifugal force relative to said shaft and forcing said rollers against said annular camming surface and thereby shifting said oblique cam axially against the resistance of said further spring means.

4. The combination according to claim 1, wherein said oblique cam has an annular groove concentric with said drive shaft, a pivoted fork member engaging in the said groove, a pull rod having two ends and connected by one of its ends to said pivotal fork member, spring means urging said cam and fork member to one end position, a power drive to the sewing machine, a clutch in said power drive, an operator controlled actuating member for said clutch, and a linkage member connecting said actuating member to the other end of said pull rod.

5. In a sewing machine in combination with a presser foot, an upper feeder foot each having a lifting bar and means for lifting said feet from the workpiece alternatively, a control device for varying the extent of such lift comprising a lever having three pivot points disposed in a triangular relation, one pivot point being at the apex of the triangle and the two pivot points being at the ends of the base of the triangle, a first pivot connection between one base point of the triangle and the lifting bar of the presser foot, a second pivot connection between the other base point of the triangle and the lifting bar of the feeder foot, a vertical guide rode pivotally connected at one end to the lever at the apex of the triangle and supported at its upper end for both vertical sliding move-

ment and rocking movement, a rocker arm having an end pivotally attached to the lever at a point adjacent to the apex of the triangle, spring means between the upper end support for said rod and the lever at the apex of the latter for depressing the two said lift bars, a drive shaft, an oblique cam supported on said drive shaft for sliding movement thereon and coupled thereto for rotation therewith, an eccentric fixed to said drive shaft, transfixed rotatably by said oblique cam, an eccentric strap on said eccentric and pivotally connected to said rocker arm, the rotation of said shaft and its oblique cam causing said eccentric rocker arm to turn said lever on the pivot connecting said guide rod to the lever and effecting raising of the said lift bars alternately, and means for imparting sliding movement to said oblique cam to vary the throw of the eccentric and thereby the lift of the said lift bars.

6. The invention according to claim 5, wherein said last means is a centrifugally actuated means carried on and rotating with the shaft and operatively coupled to said oblique cam.

7. The invention according to claim 5, wherein the last means comprises centrifugally actuated weighted

levers pivotally attached to said shaft on opposite sides thereof, yieldable means opposing outward swinging movement of the levers by centrifugal force, means forming a camming surface on said oblique cam in opposed relation to said weighted levers, cam follower means carried by said weighted levers engaging said camming surface and applying thrust against the said camming surface and effecting the said sliding movement of the oblique cam, and spring means yieldingly opposing said sliding movement of the oblique cam by centrifugally actuated movement of said weighted levers.

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